

BfR data compilation on processing factors

BfR Communication No 032/2018, 24 October 2018

As agricultural products are often processed in advance and not eaten raw, the levels of pesticide residues they contain can change. The ratio of the residue in the processed product to that in the corresponding unprocessed product is known as the processing factor. It indicates whether residues are enriched or reduced during processing. Processing factors are determined under processing conditions simulated in a laboratory. Details of studies of this kind, which have to be submitted by the manufacturers of plant protection products within the scope of authorisation processes, cannot be accessed by the general public.

For this reason, the Federal Institute for Risk Assessment (BfR) has been offering a compilation of processing factors on its website since 2007 which has now been fully revised. The data collection is aimed primarily at a professional audience. It serves among other things to support official food monitoring and risk management bodies in assessing whether the original product used in processed foods complied with legal provisions, and to help risk assessment authorities to refine exposure estimations for consumers and livestock with regard to processed foods and feeds.

The BfR has used transparent quality criteria to check every processing factor derived from a processing study. The robustness and reliability of the study results were commented on. Compared to the earlier version, the revised BfR database takes into account a much larger number of studies and gives detailed information on each one. It identifies more than 5,500 processing factors derived from the studies, the validity of which can be better estimated by the user because relevant information is provided on the most important parameters of the processing studies on which they were based.

Despite paying the greatest care and attention when compiling the database, the BfR does not accept any liability for the correctness of the information or for any legal consequences resulting from their utilisation. The processing factors contained in the data collection are not legally binding.

1 Background information on processing factors

Processing studies are conducted in order to examine the influence of processing on pesticide residues in agricultural products. They concentrate on the most important practice-relevant processing operations in industry and households, such as washing, peeling, blanching, boiling, blending and deep-frying, the production of juices, wine, beer and vegetable oils and the manufacture of cereal milling products. Processing can lead to an increase or a decrease in residues, depending on the specific processing conditions and physicochemical properties of the active substance [1].

Processing factors are important tools which serve two main purposes: providing official food monitoring authorities with information on the extent to which the residue level can change during processing on the one hand. Information of this kind is essential for assessing whether a processed food was produced from a raw product which complied with the legal maximum residue level (MRL). On the other hand, information from processing studies helps risk assessors to refine exposure estimations for consumers and livestock with regard to processed foods and feeds.

The experimental details of processing studies are not normally publicly accessible and are only available to the authorities involved in the authorisation process for plant protection products. Data is also collected in internal quality controls conducted by retailers and the food industry which are not publicly accessible either.

Processing factors are derived from processing studies. They indicate the ratio of the residue in the processed product to that in the corresponding unprocessed product. An enrichment of the plant protection product residue is indicated by processing factors greater than 1, whereas a reduction in the residue concentration in the processed product is expressed in a factor of less than 1.

Maximum residue levels (MRL) in the EU are only established in Annexes II and III of Regulation (EC) No. 396/2005 for unprocessed products such as apples, tomatoes and wheat grain, but not for processed or composite products [2]. The Codex Alimentarius established by FAO/WHO sets the maximum residue levels for the global movement of goods [3]. Although they also relate mainly to unprocessed goods, they are established for selected processed products in cases where enrichment takes place.

Processing studies are usually conducted in line with the provisions of OECD Test Guideline No. 508 "Magnitude of the Pesticide Residues in Processed Commodities" [1] and the OECD Guidance Document on Magnitude of Pesticide Residues in processed commodities [4], but these instructions do not prescribe any specific process parameters which have to be considered in the laboratory tests. It is generally recommended to simulate conditions which reflect the typical processes in the food processing industry. This results in higher variability of the test conditions and thereby also of the results which have to be taken into account in the interpretation of the processing factors.

2 Which data are housed by the database of processing factors?

Previous versions of the BfR database on processing factors almost exclusively contained factors which originated from publicly accessible sources, such as reports on the assessment of residues of pesticide active substances published annually by the FAO/WHO Joint Meeting on Pesticide Residues (JMPR), and the EFSA Conclusions and Reasoned Opinions prepared within the scope of the European review of active substances and the European MRL setting process, respectively. Contrary to this, the new version of the BfR database on the basis of more than 1,400 evaluated processing studies contains not only the processing factors, it also provides additional detailed information on the quality of the studies from which they were derived. Furthermore, information on the distribution of residues between the peel and the pulp of citrus fruits was taken into account, some of which was collected within the scope of national monitoring programmes [5] and the rest of which was acquired during internal quality controls of a trading company [6] and made available to the BfR.

More than 5,500 processing factors for a total of 190 active substances are contained in the latest BfR database, along with a large amount of additional information on such aspects as the validity of the analytical method and the storage conditions of the samples, thus allowing an assessment of the relevance of each processing factor. Where several processing factors from various individual tests are reported in a study for a certain processed food, the median is given in the data collection, along with the range of the individual values. More details on the structure and content of the database and the interpretation of the data can be taken from a current publication [7].

The database can be accessed in the BfR website under the following link:

- <https://www.bfr.bund.de/cm/349/bfr-compilation-of-processing-factors.xlsx>

A periodical update of the database is planned.

3 Graphical illustration of typical processing procedures

The BfR website also offers a graphic display of 52 typical processing procedures in the form of flow charts by means of which the database user can gain a quick overview of the relevant products and intermediate products of processing procedures and can assign processed matrices more easily.

The flow charts can be accessed in the BfR website under the following link:

- <https://www.bfr.bund.de/cm/349/bfr-compilation-of-processing-factors-flow-charts.pdf>

4 References

[1] OECD (2008) Test Guideline No. 508: Magnitude of the Pesticide Residues in Processed Commodities, OECD Guidelines for the Testing of Chemicals, Section 5, OECD Publishing.

[doi: 10.1787/9789264067622-en](https://doi.org/10.1787/9789264067622-en)

[2] Commission Regulation (EC) No 396/2005 on maximum residue levels of pesticides in or on food and feed of plant and animal origin and amending Council Directive 91/414/EEC (OJ L 70/1, 16.3.2005).

[3] Codex Alimentarius, 2016. Codex Pesticides Residues in Food Online Database. See <http://www.fao.org/fao-who-codexalimentarius/standards/pesticide-mrls/en/> (accessed 28.02.2016)

[4] Series on Testing and Assessment No 96: Guidance Document on Magnitude of Pesticide Residues in processed commodities, 29 Jul 2008;
http://www.oecd.org/document/23/0,3746,en_2649_34377_47836503_1_1_1_1,00.html

[5] BVL, 2011. Berichte zur Lebensmittelsicherheit 2011, Monitoring, [doi:10.1007/978-3-0348-0580-3](https://doi.org/10.1007/978-3-0348-0580-3)

[6] Ahlers, W., Reichert, T., 2007. Oberflächen-Konservierungsstoffe und Akute Referenzdosis - Ergebnisse einer Testreihe bei Zitrusfrüchten, Kooperation des lebensmittelchemischen Untersuchungsrings des Landesverbands Baden-Württemberg des Früchte-Import- und -Großhandels e.V. und der Atlanta AG (aktuell: Univeg Deutschland GmbH)

[7] R. Scholz, M. Herrmann, B. Michalski (2016) Compilation of Processing Factors and Evaluation of Quality Controlled Data of Food Processing Studies. J. Verbr. Lebensm., doi: 10.1007/s00003-016-1043-3